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EPA's Boiler MACT: Controlling Emissions of Hazardous Air Pollutants

Updated January 30, 2013

Congressional Research Service
https://crsreports.congress.gov
R41459

CRS REPORT
Prepared for Members and
Committees of Congress

Summary

On December 20, 2012, EPA Administrator Lisa Jackson signed final revisions to EPA's 2011 Maximum Achievable Control Technology standards for boilers (the "Boiler MACT"). The Boiler MACT has been among the most controversial EPA regulations over the last three years, because of its wide reach and potential economic impact. Boilers are widely used for heat and power throughout industry, and by large commercial establishments and institutions, as well. EPA found it difficult to adequately characterize and develop emissions data for the many types of boilers, leading many in the regulated community to complain that the originally proposed standards would not be economically achievable. Although EPA and others disputed the industry cost estimates, the revised rule modifies all of the originally proposed standards, lowering the projected cost, and grants owners and operators additional time to comply. Whether these changes will quell the long controversy or raise new issues remains to be seen.

EPA developed the regulations because it has found, based on emissions data, that boilers (especially coal-, biomass-, and liquid-fired boilers) are major sources of hazardous air pollutants (HAPs). The Clean Air Act defines a major source as any facility that emits 10 tons or more of a single listed HAP or 25 tons of any combination of HAPs annually. The HAPs themselves (187 substances) were listed by Congress in the 1990 Clean Air Act Amendments. Congress also set specific requirements for the stringency of MACT standards, limiting EPA's ability to promulgate less stringent requirements.

The revised MACT will affect about 14,000 existing boilers and process heaters, with capital costs of $4.6 billion, according to the agency. Annualized costs, which spread the costs of capital over the expected life of the equipment and include operating and maintenance expenses, are estimated by EPA at $1.2 billion per year. In response to comments on an earlier proposal and on the promulgated 2011 rule, the modified rule reduces the number of units expected to require controls, and makes the emissions standards much less stringent, cutting the agency's estimate of annualized control costs by more than half. Most of the costs of the final rule would be borne by boilers that burn coal, biomass, or liquid fuels; only 12% of the 14,000 units covered by the rule will need to install equipment to meet it. Most of the rest are fueled by natural gas or refinery gases. These boilers would not have to install pollution control equipment and most would experience cost savings under the rule's provisions, according to EPA. For the rule as a whole, EPA estimated that benefits—including the avoidance of 3,100 to 7,900 premature deaths annually—would outweigh costs by at least $23 billion per year.

Affected industries and many in Congress raised objections to the rule as proposed in 2010 and as promulgated in 2011, and bills were introduced in both the House and Senate in the 112th Congress to alter the rule's requirements and delay its implementation. H.R. 2250 passed the House 275-142 on October 13, 2011. Provisions similar to H.R. 2250 were offered as an amendment (S.Amdt. 1660) to the Senate version of the surface transportation bill (S. 1813) on March 8, 2012, but were not adopted. Numerous stakeholders have also challenged the rules in court. These challenges are expected to proceed now that EPA has finalized the rule.

In addition to the Boiler MACT, this report discusses three related rules that EPA developed at the same time, dealing with smaller "area source" boilers and with commercial and industrial boilers that burn solid waste (the "CISWI" and solid waste rules). The latter two rules have also been controversial. Revised versions of the three related rules were also finalized December 20.

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Introduction

This report provides information concerning EPA's Maximum Achievable Control Technology standards for boilers (the Boiler MACT), an EPA rule designed to reduce emissions of hazardous air pollutants, and three related rules. The related rules set standards for small boilers ("area sources") and boilers that use solid waste as fuel ("commercial and industrial solid waste incinerators"), and they identify what materials EPA considers to be solid waste.

Because boilers are used as power sources throughout industry, and for power or heat by large commercial establishments and institutions, there has been widespread interest in the requirements of all four of these rules and their potential effects. On December 20, 2012, EPA finalized changes to the four rules, revising the standards that it had promulgated March 21, 2011.[1] Owners and operators of affected boilers will have until 2016 to install equipment necessary to meet the new emission standards, with the possibility of an additional year if it is necessary.

Under the March 2011 rules, major source boilers subject to the MACT rule would have faced a May 2014 deadline for compliance. On May 16, 2011, however, EPA announced that it was staying the effective dates[2] of the Boiler MACT and one of the related rules, in order to take additional public comment and reconsider what it had promulgated, leaving in doubt both the final form of the rules and when the standards might go into effect. The federal District Court for the District of Columbia vacated the agency's stay on January 9, 2012,[3] but the court's action had little effect, as EPA subsequently issued a "No Action Assurance Letter." The letter stated that the agency would exercise its enforcement discretion to not enforce certain notification deadlines in the March 2011 rule.[4]

The agency also proposed, in its reconsideration of the rules, to extend the effective date (and hence the required compliance date) of the Boiler MACT until three years after completion of the rules' reconsideration.[5] In December 2012, the agency finalized that decision. Thus, when the agency publishes the reconsidered rules in the *Federal Register*, it will have added about two years to the deadline for emissions sources to comply. In addition, the preamble to the reconsidered rule notes that:

> ... the CAA allows title V permitting authorities to grant sources, on a case-by-case basis, extensions to the compliance time of up to one year if such time is needed for the installation of controls.... Permitting authorities are already familiar with, and in many cases have experience with, applying the 1-year extension authority under section 112(i)(4)(A) since the provision applies to all NESHAP [National Emission Standards for

[1] The changes have not appeared in the *Federal Register* as of this writing, but a pre-publication copy of the rules is available at http://www.epa.gov/airquality/combustion/actions.html. The 2011 standards are at U.S. EPA, "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters; Final Rule," 76 *Federal Register* 15608, March 21, 2011, which is also accessible through EPA's boiler webpage. A boiler MACT rule was first promulgated in 2004, but the 2004 version of the rule was vacated and remanded to EPA by the D.C. Circuit Court of Appeals. EPA has been under a court order to promulgate a replacement since the court's decision in 2007.

[2] The rules, as promulgated, had effective dates of May 20, 2011, although compliance with their emission standards would not have been required until at least three years later.

[3] Sierra Club v. Jackson, No. 11-278 (D.D.C. Jan. 9, 2012).

[4] The No Action Assurance Letter, dated February 7, 2012, can be found at http://www.epa.gov/ttn/atw/boiler/boiler_ciswi-no_action_2012-02-07.pdf.

[5] 76 *Federal Register* 80616, December 23, 2011.

> Hazardous Air Pollutants]. We believe that should the range of circumstances that commenters have cited as impeding sources' ability to install controls within three years materialize, then it is reasonable for permitting authorities to take those circumstances into consideration when evaluating a source's request for a 1-year extension, and where such applications prove to be well-founded, it is also reasonable for permitting authorities to make the 1-year extension available to applicants.[6]

Thus, the agency envisions up to a four-year compliance deadline if sources can demonstrate that extra time is needed for the installation of controls.

Given the boiler rules' potential impacts, Congress has taken a strong interest in them. EPA estimates that, as finalized on December 20, 2012, the Boiler MACT will affect about 14,000 boilers and process heaters.[7] In order to reduce emissions of a wide array of hazardous air pollutants, about 12% of the affected units would be required to install pollution control equipment. The 12% include coal-fired, biomass-fired, and liquid-fired boilers. The agency estimates the capital costs associated with the rule for existing boilers at $4.6 billion to meet the compliance deadline in 2016; annualized costs, which spread the costs of capital over the expected life of the equipment and include operating and maintenance costs as well, were estimated at $1.2 billion per year. These cost estimates are less than half the estimated cost of EPA's originally proposed version of the rule, for reasons that we will explore below.

As shown in **Table 2**, later in this report, most boilers—84% of those affected by the rule—are fueled by natural gas or similar gases such as refinery gas, according to EPA. These gas-powered boilers would incur capital costs averaging a little less than $6,500 per unit, according to the agency. Through fuel savings, the agency expects a reduction in operating costs to more than compensate for the capital expenditures of most gas-powered units.

Why Is EPA Considering Regulating These Sources?

EPA has developed regulations addressing boiler emissions because it has found, based on emissions data, that they are major sources of hazardous air pollutants (HAPs). Section 112 of the Clean Air Act, which requires controls on major sources of HAPs, defines a major source as any facility that emits 10 tons or more of a single listed HAP or 25 tons of any combination of HAPs annually. The HAPs themselves (187 substances) were listed by Congress in the 1990 Clean Air Act Amendments.

Boilers emit at least 20 of the listed HAPs, including mercury, arsenic, chromium, cadmium, selenium, nickel, lead, manganese, phosphorous, antimony, beryllium, polycyclic organic matter, benzene, formaldehyde, acetaldehyde, dioxins, furans, hydrogen chloride, hydrogen cyanide, and hydrogen fluoride. Six of these 20 are classified as known or probable human carcinogens. Others affect the lungs, skin, central nervous system (including adverse developmental effects), and/or

[6] Boiler MACT, Final Action on Reconsideration, pre-publication copy, December 20, 2012, pp. 27-28.

[7] The data in this paragraph are primarily from Boiler MACT, Final Action on Reconsideration, pre-publication copy, December 20, 2012, Table 5, p. 92. Also see "EPA's Air Toxic Standards, Major and Area Source Boilers and Certain Incinerators, Technical Overview, Adjustments from March 2011 Final Standards," p. 3, at http://www.epa.gov/airquality/combustion/docs/20121221_tech_overview_boiler_ciswi_fs.pdf.

kidneys.[8] By controlling boiler emissions, EPA expects to avoid 3,100 to 7,900 premature deaths annually, as well as many other health effects, including 5,000 nonfatal heart attacks annually.[9]

The Boiler MACT will replace a rule promulgated on September 13, 2004, and subsequently vacated and remanded to EPA by the D.C. Circuit Court of Appeals.[10] The court vacated that rule in 2007, saying EPA had wrongly excluded many industrial boilers from the definition of solid waste incinerators, which have more stringent emissions requirements under the Clean Air Act. EPA was under a court order to finalize replacement rules by February 21, 2011. Meanwhile, boiler emissions have been subject to state standards, which are generally not as stringent as what EPA has proposed.

Reconsideration of the 2011 Rule

In early December 2010, the agency petitioned the District Court for the District of Columbia for up to 15 months of additional time to complete the rulemaking. The agency argued that in light of the extensive comments it received on the proposed rules, "EPA believes that the overall public interest is best served by allowing EPA to re-propose the rules so that [it] will be able to issue emission standards that are based upon a thorough consideration of all available data and reduce potential litigation risks."[11] The court had issued a summary judgment against the agency in 2006 for failure to discharge fully its duty to promulgate standards for emissions of hazardous air pollutants.[12] On March 31, 2006, the court imposed a schedule under which EPA was to have discharged all of the statutory duties at issue by June 15, 2009. That deadline was subsequently extended by more than a year and a half.

On January 20, 2011, the court denied EPA's request for a further 15-month extension, concluding that EPA had engaged in discretionary delay in the face of a congressional directive (i.e., the 1990 Clean Air Act Amendments, under which the rules were to have been promulgated by November 2000); the court gave the agency one month to issue final rules.[13] Having been denied the extension it sought, the agency issued a statement saying, "The standards will be significantly different than what EPA proposed…. The agency believes these changes still deserve further public review and comment and expects to solicit further comment through a reconsideration of the rules."[14]

True to its word, the agency issued a Notice of Reconsideration at the same time that it promulgated the final rule in March 2011. The notice listed 14 provisions for which the agency thought additional opportunity for public review and comment should be obtained, and it stated

[8] U.S. EPA, "National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters; Proposed Rule," 75 *Federal Register* 32048, June 4, 2010. Also, see Comments of Clean Air Task Force, Earthjustice, Natural Resources Defense Council, and the Sierra Club on National Emission Standards for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters: Proposed Rule, Docket ID No. EPA-HQ-OAR-2002-0058, August 23, 2010, p. 3.

[9] U.S. EPA, Boiler MACT, Final Action on Reconsideration, pre-publication copy, December 20, 2012, pp. 96-97.

[10] Natural Resources Defense Council v. EPA, 489 F. 3d 1250, 1257–61 (DC Cir. 2007).

[11] Sierra Club v. Jackson, No. 01-1537, 2001 Westlaw 181097, at *7 (D.D.C. January 20, 2011).

[12] Sierra Club v. Johnson, 444 F. Supp. 2d 46, 47 (D.D.C. 2006). This case is separate from the vacatur and remand of the Boiler MACT in the 2007 NRDC v. EPA decision. In effect, there are two courts in two separate proceedings overseeing EPA's boiler rules.

[13] *Sierra Club*, 2001 Westlaw 181097.

[14] U.S. EPA, "EPA Announces Next Steps on Emissions Standards for Boilers, Certain Incinerators," Press Release, January 20, 2011, at http://yosemite.epa.gov/opa/admpress.nsf/6424ac1caa800aab85257359003f5337/58f5bee5e13c61228525781e007e9881!OpenDocument.

that the agency might seek public comment on other aspects of the rules. The 14 provisions included such basic elements as the subcategories used to set standards in the boiler rule, the emission standards themselves, and the monitoring requirements. This left numerous questions concerning not only the substance of the rule, but the schedule for implementation. Following promulgation, existing facilities would normally have three years to comply with the standards, but since the agency was reconsidering key aspects of the rules, one was left to wonder how regulated entities should determine what standards they would ultimately be required to comply with, and on what schedule. By staying the effective date of the standards on May 16, 2011, the agency addressed this uncertainty, effectively giving itself and regulated entities an extension of time that the court had denied them. In the end, the agency added almost two years to its deliberation process before finalizing the reconsidered rules in December 2012.

The Re-Promulgated Standards

Emission Standards for Existing Units

In order to understand the standards that EPA finalized in December 2012 and the controversy surrounding them, it helps to begin with the agency's June 4, 2010, proposal (which we refer to, generally, in this report as the standards EPA "originally" proposed). In that proposal, EPA divided boilers into 11 subcategories, with separate emission limits for new and existing units in 9 of the 11.[15] The nine subcategories included three types of coal-fired boilers and four types of biomass-fired boilers.[16]

The proposed emission limits covered five substances (or groups of substances): mercury; dioxins/furans; particulate matter (as a surrogate for non-mercury metals); hydrogen chloride[17] (as a surrogate for all acid gases); and carbon monoxide (as a surrogate for non-dioxin organic air toxics, including formaldehyde).[18] As explained below, EPA has now replaced the emission standards for dioxins/furans with a work practice standard; thus, the final emission standards only address four groups of pollutants.

The Clean Air Act requires that MACT emission standards be based on the emission control achieved by the best controlled similar sources. Thus, the emission limits originally proposed for the five groups of pollutants were based on monitoring data obtained from facilities in each of the nine subcategories of existing boilers.[19]

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[15] The other two subcategories were only required to meet work practice standards. Work practice standards require certain actions from the regulated entity (e.g., the boiler must be tuned up annually, or the owner must conduct an assessment to identify energy conservation opportunities), but they don't set numeric standards for emissions.

[16] The three types of coal-fired boiler identified in the proposed rule were coal stoker, coal fluidized bed, and pulverized coal. The four types of biomass-fired boilers were biomass stoker, biomass fluidized bed, biomass suspension burner/Dutch oven, and biomass fuel cells. In addition, the agency proposed emission limits for liquid-fueled boilers, and gas-fired boilers using "other process gases."

[17] Hydrogen chloride is often referred to as hydrochloric acid, because when the gas encounters water in the atmosphere it forms an acidic solution of hydrochloric acid.

[18] The specific emission limits EPA proposed for each of the five pollutants can be found in the June 4, 2010, *Federal Register* at p. 32012, Table 1.The reconsidered final standards are on EPA's website at http://www.epa.gov/airquality/combustion/actions.html, Table 3.

[19] EPA has acknowledged that it did not have as much data as it might have wished to use in establishing the boiler subcategories and the originally proposed MACT standards. In a September 28, 2010, letter, the Administrator stated: "In an effort to establish subcategories wherever appropriate, and to calculate accurately the standards for each subcategory, EPA asked the affected companies and institutions for technical data about their facilities long before the

- For *new* sources, the statute requires (in §112(d)(3)) that standards be based on the emission control achieved by the best controlled similar source.
- For *existing* sources, on the other hand, the same subsection of the statute requires standards no less stringent than the average emission limitation achieved by the best performing 12% of existing sources. The performance of the best 12% is generally referred to as the "MACT floor," since it sets the minimum requirements for MACT standards. The MACT floor is based solely on the performance of existing facilities in the category or subcategory of sources, with no consideration of the cost or economic impacts thereof. The Administrator is only allowed to take costs, health, energy, and environmental factors into consideration to the extent that she considers setting standards that go beyond the floor.

Given the statutorily required methodology for identifying the MACT floor, the number of subcategories the agency identifies is an important factor in determining how stringent the standards will be: the more subcategories EPA identifies, the more variation there will be in the MACT floor for each, and thus the more flexibility the agency will have in setting different, potentially less stringent emission standards for different boiler types. If, because of subcategorization, the Administrator decided that a subcategory's MACT floor did not provide sufficient protection for human health or the environment, she would still have the authority to set "beyond the floor" standards for a subcategory: in doing so, however, she could consider the cost of the standards and other factors. Thus, one issue raised by commenters on the proposed rule was whether EPA's subcategorization of the boiler universe appropriately considered the differences in size, fuels, boiler design, location, etc., or whether the subcategories should be modified from those originally proposed.

In the reconsidered rule, EPA responded to the comments it received by modifying its subcategories. Instead of 11 types of boiler, the final rule identified 19, including four types of coal-fired units, seven biomass subcategories, and three subcategories of liquid-fueled boilers. Based on new data provided by industry and on some corrections to the data it had used earlier, the emission standards for almost every subcategory have been modified.

The net effect of all these changes is a substantial easing of the originally proposed standards' stringency. As shown in **Table 1**, existing coal-fired boilers will be allowed to emit 100% more particulate matter (PM), 10% more hydrogen chloride (HCl), 90% more mercury, and 44% to 350% more carbon monoxide than would have been allowed by the original June 2010 proposal. The increase in allowable emissions is even greater for most of the pollutants emitted by existing biomass units: they will be allowed to emit more than triple the HCl, six times the mercury, and as much as 22 times the PM that would have been allowed under the originally proposed standards. The standards for liquid-fueled units also changed, allowing six times as much mercury and at least 130 times the carbon monoxide.

court-ordered deadline for publishing a proposal. As is often the case in §112 rulemaking efforts, however, EPA did not receive many data. While the agency was not left entirely lacking in relevant information, the limited response from affected businesses and institutions did make it difficult for EPA to delineate subcategories and calculate standards that fully reflected operational reality. The agency nevertheless was legally required to publish proposed subcategories and standards based on the information it had at the time." Letter of EPA Administrator Lisa P. Jackson to Senator Mary L. Landrieu, September 28, 2010, p. 2.

Table 1. Change in Emission Standards for Existing Major Source Boilers, December 2012 Reconsidered Boiler MACT vs. June 2010 Proposed Rule

(% change in proposed emission standards)

Subcategory	Estimated Number of Units	Particulate matter (PM)	Hydrogen chloride (HCl)	Mercury	Carbon monoxide
Coal					
Coal Stoker	621	+100%	+10%	+90%	+220%
Coal Fluidized Bed					+333%
Coal Fluidized Bed w. FB Heat Exchanger					+367%
Pulverized Coal					+44%
Biomass					
Biomass – Wet Stoker / Sloped Grate / Other	502	+85%	+267%	+533%	+168%
Biomass – Kiln-Dried Stoker / Sloped Grate / Other		+1,500%			-18%
Biomass Fluidized Bed		+450%			+1,780%
Biomass Suspension Burner		+155%			+138%
Biomass Dutch Ovens / Pile Burners		+1,300%			-24%
Biomass Fuel Cells		no change			+307%
Biomass Hybrid Suspension Grate		+2,100%			+177%
Liquid					
Heavy Liquid	955	+1,450%	+22%	+533%	+12,900%
Light Liquid		+98%			
Non-continental Liquid		+6,650%			
Gas					
Other Process Gases (Gas 2)	129	-87%	+56,566%	+3,850%	+12,900%

Source: U.S. EPA, Proposed (June 2010) Boiler MACT *Federal Register* notice, Table 1, and pre-publication Final Reconsideration notice, Table 3. Percentages calculated by CRS.

Notes: In addition to these changes to the numeric emission standards, the agency's December 2012 standards replace the emission standards for dioxins and furans with a work practice standard. As an alternative to the PM

standards, the December 2012 rule also allows regulated entities to meet numeric emission standards for Total Selected Metals (TSM). TSM emission standards were not specified in the originally proposed rule.

Of the changes provided by the reconsidered standards, the dioxin/furan standards may be the most significant. EPA determined that the dioxin limits in the March 2011 standards had been set below levels that could be accurately measured. As a result, the agency replaced the numeric emission limits that it had set in March 2011 with work practice standards: the latter will require an annual tune up of the boiler to ensure good combustion, which EPA believes will ensure minimal dioxin emissions without requiring emissions monitoring.

A second issue raised by critics of the agency's original proposal had to do with the way that EPA identified the best performers within the subcategories. As it has done previously for other categories of sources, EPA has averaged the emissions performance of the top 12% of existing units separately for each of the four pollutants subject to emission limits. Critics who believed the proposed standards were too stringent argued that by considering the pollutants separately, the agency was, in effect, cherry-picking the best performers and setting a combined standard for the pollutants that no existing facility may actually meet.

This question—whether one identifies the best-performing sources pollutant-by-pollutant or for all the pollutants as a group—was addressed in regard to another standard, the Hospital/Medical/Infectious Waste Incinerator rule, which EPA promulgated in October 2009. In promulgating that rule, the agency stated:

> There is no reason not to consider emissions data and controls in use at sources that may be the best performers from some pollutants but not for other pollutants. The MACT floor controls applicable for one pollutant do not preclude the use of MACT floor controls for another pollutant. Therefore, it is appropriate to consider controls at sources employing MACT controls for some pollutants, but not all.[20]

EPA acknowledged in the preamble to that rule that "there appears … to be a substantial ambiguity in the statutory language about whether the MACT floor is to be based on the performance of an entire source or on the performance achieved in controlling particular hazardous air pollutants."[21] But the agency noted that commenters in the past have not objected to the use of the pollutant-by-pollutant approach. They also noted that the D.C. Circuit Court of Appeals has reviewed MACT floor determinations made on a pollutant-by-pollutant basis without finding error in the approach.[22] Thus, the agency believes the best reading of the act is that the standards are to be set on a pollutant-by-pollutant basis—the only exception being if there is reason to believe that control of one pollutant will lead to increased emissions of another.

In the preamble to the March 2011 Boiler MACT standards, EPA provided a similar discussion, concluding that, although the language of Section 112(d)(3) is ambiguous, "EPA's HAP-by-HAP approach fulfills the evident statutory purpose and is supported by the most pertinent legislative history."[23] The agency did not reconsider this aspect of its standard-setting process. The reconsidered standards, although modified, still embody a pollutant-by-pollutant approach.

[20] U.S. EPA, "Standards of Performance for New Stationary Sources and Emissions Guidelines for Existing Sources: Hospital/Medical/Infectious Waste Incinerators; Final Rule," October 6, 2009, 74 *Federal Register* 51381.

[21] Ibid.

[22] Ibid. The case in question was Sierra Club v. EPA, 167 F.3d 658, 660 (D.C.Cir. 1999).

[23] The full discussion is found in Section V.A. of the Preamble, at 76 *Federal Register* 15621-15623, March 21, 2011.

Work Practice Standards for Existing Units

In the final reconsidered rules, three subcategories are not subject to emission limits. Most of these units are natural gas/refinery gas/clean gas units (a subcategory that EPA calls Gas 1). For these, the agency set only a work practice standard, requiring that the boilers be tuned up periodically and that the owners submit reports to EPA setting forth specific information from the tune-up procedure. The Administrator has authority to substitute a work practice standard for emission standards when, in her judgment, it is not feasible to prescribe or enforce an emission standard. As noted earlier, 84% of existing boilers fall into the natural gas/refinery gas/other clean gas subcategory, and thus are only subject to the tune-up requirements.

Work practice standards (in lieu of emission standards) were also established for limited use boilers. Limited use boilers are defined as units that have an enforceable average annual capacity factor of no more than 10%.

All boilers are also required to perform a one-time energy assessment to identify cost-effective energy conservation measures.

Standards for New Boilers

EPA also promulgated MACT standards for new (as opposed to existing) major source boilers. These standards are, in most cases, more stringent than the standards for existing units.[24] The agency assumes that no new coal-fired major source boilers (and very few major source boilers of any kind) will be built in the next three years. The agency has stated that the projected type and number of new boilers comes from the Energy Information Administration at the Department of Energy and is not based on the Boiler MACT.[25]

Of the estimated 1,844 new units, the agency expects 1,762 to be powered by natural gas, with annualized costs of compliance averaging $2,900 apiece. The other 82 new boilers are projected to be fueled by biomass, with annual compliance costs of $1.2 million each.[26]

EPA's Estimates of the Boiler MACT's Costs and Benefits

Among the existing boilers affected by the Boiler MACT rule, there are an estimated 955 units that burn liquids and 1,123 units that burn solids (621 of them coal-fired and the rest biomass-fired). The rule also applies to other types of boilers, but the 2,078 liquid, coal, and biomass units, which account for 14.7% of the affected units, account for 97% of the compliance cost for existing units.

In general, the promulgated emission limits apply to boilers that have a designed heat input capacity of 10 million Btu per hour or greater. How big is this? A coal-fired boiler subject to the MACT would be one that is capable of burning roughly 1,000 pounds (a half-ton) of coal per hour.[27] Wood has less energy per pound than coal: a biomass-fired boiler burning wood might

[24] Boiler MACT, Final Action on Reconsideration, pre-publication copy, December 20, 2012, Table 3, pp. 92-93.

[25] Letter of EPA Administrator Lisa P. Jackson to Senator Mary L. Landrieu, September 28, 2010, p. 2.

[26] Boiler MACT, Final Action on Reconsideration, pre-publication copy, December 20, 2012, Table 3, p. 93. Per unit costs calculated by CRS.

[27] A rough rule of thumb for coal is that it contains about 10,000 Btus of energy per pound. To be more precise, the

require as much as 1,500 pounds of wood per hour to produce 10 million Btus. A boiler burning fuel oil would need to burn about 70 gallons per hour. Many of the boilers to be regulated are substantially larger than this. An analysis released by the Council of Industrial Boiler Owners (CIBO), for example, used a 250 million Btu/hour boiler as the base for its cost estimates.[28] For a boiler burning fuel oil, this would mean burning 1,750 gallons per hour.

In order to comply with the rule's emission limits, these facilities may need to install fabric filters (also known as baghouses) to achieve PM and mercury control; wet scrubbers to meet the hydrochloric acid limits; replacement burners, tune-ups, and combustion controls for carbon monoxide and organic HAPs; and carbon injection for mercury control. These are the available technologies for maximum control of the relevant emissions.

Some observers maintain that, because EPA weakened the standards as compared to what it originally proposed, the vast majority of facilities won't have to install these technologies. The National Association of Clean Air Agencies (NACAA), the association that represents most state and local air pollution control officials, surveyed its members in 2008 to determine what should be defined as MACT. Using the data it obtained from state officials, NACAA concluded that EPA's 2011 final mercury emission standard for coal-fired boilers was almost 16 times higher than the average of the best performing 12%[29]; the carbon monoxide standard was 213 times what the MACT floor should be, according to NACAA.[30] The problem according to NACAA's Executive Director, is that "Compliance test results provided by state and local permitting officials were not used [in setting the MACT standards]; instead EPA relied on industry data."[31]

EPA explained that some of the data that NACAA provided could not be used, because the test reports were incomplete. The agency also noted that its process for setting a standard is more complicated than simply averaging the best test results. Specifically, the agency subjects the emissions data to what is called a "variability analysis." This type of analysis attempts to recognize that operating conditions and resulting emissions vary over time, yet facilities need to be in compliance with emissions limits at all times. Emissions can change for several reasons: there is variation in the amount of contaminants in fuel, for example; the boiler will sometimes be operating at less than full load; and statistical tests applied to the data are used to set the actual standard. The agency first identifies the best 12% by ranking the units based on their best test results. In the next step, they add all available test results for those units. Finally, using a statistical test, they calculate a standard that these units can meet 99% of the time, despite variability in operating conditions. This results in standards that are less stringent than the straight average of the best 12% test results.[32]

heating value ranges from 6,500 to 13,000 Btus per pound, depending on rank (i.e., type of coal), with bituminous coal containing more than 10,000 and subbituminous and lignite less.

[28] IHS Global Insight for CIBO, *The Economic Impact of Proposed EPA Boiler/Process Heater MACT Rule on Industrial, Commercial, and Institutional Boiler and Process Heater Operators*, August 2010, Appendix A, p. 28.

[29] In the reconsidered final rule, the mercury standard is 24% higher than that.

[30] The CO standard has been lowered by roughly two-thirds in the reconsidered final rule, but it is still more than 50 times what NACAA calculated the MACT floor to be.

[31] Bill Becker, "Clean Air Issues Facing States and Localities: Regulatory Update," presentation, Institute of Clean Air Companies, April 27, 2011.

[32] For a further discussion of variability analysis, see Amanda Singleton, ERG (Eastern Research Group, Inc.), "Revised MACT Floor Analysis (2011) for the Industrial, Commercial, and Institutional Boilers and Process Heaters National Emission Standards for Hazardous Air Pollutants – Major Source," Memorandum to Brian Shrager, U.S. EPA, January 4, 2011, at http://www.epa.gov/ttn/atw/boiler/rev_mact_floor_analysis_major_boilers_process_heaters.pdf.

Costs Projected by EPA

As shown in **Table 2**, EPA estimates the capital costs of the reconsidered rule for existing boilers to be $4.6 billion, with annualized costs of nearly $1.2 billion.[33] These costs fall almost entirely on units burning solids (coal or biomass) and liquids. Most boilers, which are fueled by natural gas, will experience a reduction in operating costs that more than compensates for any capital costs, according to EPA.

In order to estimate what impact these costs would have on the economy, EPA used a multi-market partial equilibrium model developed for its Office of Air Quality Planning and Standards. The model projected how stakeholders in 100 U.S. industries might respond to the promulgated rule. The model found no U.S. industry in which production would decline by more than 0.05%.[34]

Despite the clear advantage that the promulgated rule would give to natural-gas-fired boilers, EPA did not consider fuel-switching as a potential compliance strategy (except in the limited case of liquid-fueled boilers that already have the capability to burn natural gas), for a variety of reasons. In the preamble to the originally proposed rule, the agency stated: "This decision was based on the overall effect of fuel switching on HAP emissions, technical and design considerations discussed previously in this preamble, and concerns about fuel availability."[35] Although switching from solid to gaseous fuels "would decrease PM and some metals emissions, emissions of some organic HAP (e.g., formaldehyde) would increase,"[36] according to the agency's analysis. Further, the agency maintained, natural gas may be unavailable:

> Natural gas pipelines are not available in all regions of the U.S., and natural gas is simply not available as a fuel for many industrial, commercial, and institutional boilers and process heaters. Moreover, even where pipelines provide access to natural gas, supplies of natural gas may not be adequate.[37]

Table 2. Estimated Costs to Existing Boilers for Compliance with EPA's Final Reconsidered Boiler MACT

Subcategory	Estimated Number of Affected Units	Capital Costs ($ million)	Annualized Cost ($ million)	Annualized Cost per Unit ($ thousand)
Coal units	621	$2,554	$904	$1,456
Biomass units	502	$405	$109	$217
Heavy-liquid units	319	$761	$221	$693
Light-liquid units	615	$712	$166	$270
Non-continental liquid units	21	$62	$17	$810

[33] U.S. EPA, Boiler MACT, Final Action on Reconsideration, pre-publication copy, December 20, 2012, p. 90.

[34] U.S. EPA, "Regulatory Impact Results for the Reconsideration Final Rule for National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters at Major Sources," Memorandum from Tom Walton to Jim Eddinger, December 19, 2012, pp. 3-4, at http://www.epa.gov/airquality/combustion/docs/boilerreconfinalria121220.pdf. Hereinafter referred to as "December 2012 Regulatory Impact Analysis."

[35] U.S. EPA, Proposed Boiler MACT, 75 *Federal Register* 32019, June 4, 2010.

[36] Ibid.

[37] Ibid.

Subcategory	Estimated Number of Affected Units	Capital Costs ($ million)	Annualized Cost ($ million)	Annualized Cost per Unit ($ thousand)
Gas 1 (natural gas / refinery gas / other clean gas) units	11,929	$77	($295)	($25)
Gas 2 (other) units	129	$138	$58	$450
Total	**14,136**	**$4,632**	**$1,180**	**—**

Source: U.S. EPA, Boiler MACT, Final Action on Reconsideration, pre-publication copy, December 20, 2012, Table 5, p. 92. The EPA table adds $28 million to the annualized cost for energy assessments at all facilities, not allocated by type of unit.

Notes: Parentheses indicate lower costs, resulting from fuel savings. Per unit cost was calculated by CRS. Some of the difference in unit costs could be accounted for by differences in boiler size.

Nevertheless, if the cost of compliance is sufficiently great, the incentive to explore fuel-switching would seem substantial, particularly for facilities not burning a byproduct of the plant's operation. Recent accounts of the substantial increases in gas reserves as shale gas resources are developed could ease some of the natural gas availability concerns, and might bear further analysis.[38]

Benefits Projected by EPA

EPA estimates that implementation of the Boiler MACT, as promulgated, would reduce nationwide emissions from major source boilers and process heaters, compared to emissions in by

- 3,100 to 5,300 pounds per year of mercury,
- 2,500 tons per year (tpy) of non-mercury metals,
- 39,000 tpy of hydrogen chloride,
- 16,593 tpy of directly emitted fine particulate matter ($PM_{2.5}$),
- 180,000 tpy of carbon monoxide, and
- 571,727 tpy of sulfur dioxide.[39]

For most of these pollutants, the expected reductions are similar to those of the originally proposed rule. This is not the case for mercury, however. The June 2010 proposed version of the rule was estimated to reduce mercury emissions by 7.5 tons, three to five times as much as the current proposal. Boilers are currently thought to be the fourth-largest stationary source of mercury, yet other categories of sources have been required to reduce mercury emissions to a greater extent than will be required by the promulgated or reconsidered Boiler MACT rule.[40]

[38] See, for example, the U.S. Energy Information Administration's *Annual Energy Outlook 2010 with Projections to 2035*, at http://www.eia.doe.gov/oiaf/aeo/gas.html: "A 4-fold increase in shale gas production from 2008 to 2035 more than offsets a 31-percent decline in other lower 48 onshore natural gas production in the AEO2010 Reference case. Significant increases in shale gas production are expected in the Northeast, Gulf Coast, and Midcontinent regions…." Also, CRS Report R41543, *Global Natural Gas: A Growing Resource*, by Michael Ratner.

[39] U.S. EPA, Boiler MACT, Final Action on Reconsideration, pre-publication copy, December 20, 2012, p. 95, and December 2012 Regulatory Impact Analysis.

[40] EPA National Emissions Inventory, "Trends in Mercury Air Emissions Between 1990 and 2005," June 28, 2010, and U.S. EPA, "Emissions Overview: Hazardous Air Pollutants in Support of the Proposed Toxics Rule," March 15, 2011,

EPA's explanation for the continued mercury emissions is that much of the remaining mercury comes from small oil-fired boilers, which do not currently have controls, and which individually emit relatively small amounts of mercury. Thus, when the agency defined MACT for these units, it did not result in substantial mercury reductions.[41]

According to EPA, beginning in 2015, emission reductions resulting from the rule would lead to important health benefits, including the annual avoidance of:

- 3,100 to 7,900 premature deaths,
- 2,000 cases of chronic bronchitis,
- 5,000 nonfatal heart attacks,
- 5,350 hospital and emergency room visits,
- 4,600 cases of acute bronchitis,
- 390,000 days when people miss work,
- 51,000 cases of aggravated asthma, and
- 96,000 cases of respiratory symptoms.[42]

EPA estimates the annual value of these benefits to range from $25 billion to $67 billion in 2015—outweighing the annualized costs by at least $23 billion. In its Regulatory Impact Analysis, the agency stated that it was only able to provide a partial estimate of the value of the rule's benefits:

> We were unable to monetize the direct benefits associated with reducing HAPs in this analysis. In Section 7.5.5 of this RIA, we provide a full qualitative discussion of the direct health benefits associated with the reductions in emissions of HAPs anticipated by these rules, including a full discussion of the complexity associated with monetizing HAP benefits. We also provide maps of reduced mercury deposition in that section. Therefore, all monetized benefits provided in this analysis only reflect improvements in ambient $PM_{2.5}$ and ozone concentrations. Thus, the monetized benefits estimate is an underestimate of the total benefits. The extent of this underestimate, whether small or large, is unknown.[43]

Other Cost Estimates

Not surprisingly for a rule of this size, EPA's cost estimate is not the only one available. Industry-funded studies of the originally proposed and subsequent versions of the rule, including one from the Council of Industrial Boiler Owners (CIBO), placed the costs of the rule substantially higher

available to congressional clients on request.

[41] Personal communication, U.S. EPA, Office of Air Quality Planning and Standards, December 15, 2011.

[42] U.S. EPA, Boiler MACT, Final Action on Reconsideration, pre-publication copy, December 20, 2012, pp. 96-97.

[43] Regulatory Impact Analysis, previously cited, p. 7-3. In the qualitative discussion of the benefits of reducing HAP emissions, the RIA states that the effects of exposure to HAP emissions can include neurological, cardiovascular, liver, kidney, and respiratory effects as well as effects on the immune and reproductive systems and cancer. Reducing emissions may reduce these effects, but none of these benefits were quantified in the benefit estimates. As summarized by the agency's Science Advisory Board, "(T)he challenges for assessing progress in health improvement as a result of reductions in emissions of hazardous air pollutants (HAPs) are daunting ... due to a lack of exposure-response functions, uncertainties in emissions inventories and background levels, the difficulty of extrapolating risk estimates to low doses and the challenges of tracking health progress for diseases, such as cancer, that have long latency periods." (RIA, p. 7-43) As a result, the agency concluded, "Large reductions in HAP emissions may not necessarily translate into significant reductions in health risk because toxicity varies by pollutant and whether or not there are exposures at or above levels of concern is not known." (RIA, p. 7-41) Also see December 2012 Regulatory Impact Analysis, p. 5.

than EPA's estimates. An analysis by the American Forest and Paper Association found especially high costs and potential job losses in the forest products industries. By contrast, the National Association of Clean Air Agencies concluded that CIBO's study exaggerated the potential costs. EPA itself maintains that Clean Air Act rules have often proven less expensive than its own and affected industries' estimates have projected before they were promulgated.[44]

Given the short time since the reconsidered (December 2012) rule was finalized, affected industries have not generally provided as much detail regarding their view of its effects, although CIBO, for one, still believes the rule will be more costly than EPA's projections. CIBO reduced its estimate of the rule's cost from $20.7 billion (for the originally proposed rule) to $11.7 billion for the reconsidered version, but still says the rule will put 187,00 jobs "at risk" of being eliminated.[45]

As noted earlier, though, EPA legally cannot take cost or economic impact into consideration in identifying the MACT floor, and almost all of the numeric standards in the rule are based on the agency's determination of the MACT floor. The only exceptions, the PM emission limits for biomass-fueled units, would impose no additional cost, according to EPA, because they rely on equipment installed to meet a MACT-floor standard for mercury.[46] EPA considered the feasibility of its standards indirectly, by establishing 19 subcategories of sources, but in setting MACT floors for them, it cannot base its decisions on cost considerations.

Should EPA Have Set Health-Based Standards Under Section 112(d)(4)?

According to EPA, "emissions data collected during development of the proposed rule show that hydrogen chloride [HCl] emissions represent the predominant HAP emitted by industrial, commercial, and institutional (ICI) boilers, accounting for 61 percent of the total HAP emissions."[47] Given the importance of HCl emissions, one of the key issues in considering EPA's original proposal was whether the agency should have exercised its authority to set standards for HCl and other acid gases under Section 112(d)(4), which gives the Administrator flexibility to set standards less stringent than MACT for HAPs that have a health threshold (i.e., substances that are not harmful to people exposed to levels below some threshold).

In developing and promulgating other regulations, including the vacated 2004 MACT standard for boilers, EPA established that HCl has a health threshold, that it is not classified as a human carcinogen, and that there is limited health risk associated with HCl emissions from discrete units. Nevertheless, in the June 2010 proposal (and in the final standards), the Administrator decided not to exercise her discretion to set less stringent standards for HCl emissions for several reasons, including

1. the agency lacked information on the peak short-term emissions of HCl from boilers and thus could not determine whether acute exposures will pose health concerns;

[44] A more detailed discussion of these studies was included in an earlier version of this CRS report, which is available from the author to congressional clients upon request.

[45] CIBO, *Boiler Blast News*, January 2013.

[46] U.S. EPA, Boiler MACT, Final Action on Reconsideration, pre-publication copy, December 20, 2012, p. 39.

[47] Boiler MACT proposal, 75 *Federal Register* 32011, June 4, 2010.

2. HCl emissions from boilers mix with other emissions that are respiratory irritants, and EPA has no studies explicitly addressing the toxicity of these mixtures;
3. in considering whether to exercise her discretion under Section 112(d)(4), the Administrator must determine that a health-based standard in lieu of a MACT will not result in adverse environmental effects. HCl gas forms an acidic solution in the atmosphere and could exacerbate the impacts of acid deposition from sulfur and nitrogen oxides;
4. the agency had limited information on facility-specific emissions that it would need to set a health-based standard;
5. the agency would have needed to decide whether it would be appropriate to set 112(d)(4) standards for each acid gas emitted by boilers, or a single standard as a surrogate for them all; and
6. as proposed (and as promulgated), the MACT standard would result in significant reductions in emissions of other pollutants, most notably sulfur dioxide, particulate matter, other acid gases, mercury, and other metals. These reductions would provide substantial public health benefits that would be foregone if the agency set a less stringent standard.[48]

Whether the agency should have set standards for HCl under Section 112(d)(4) was one of the key points raised in comments, including those submitted by 41 Senators in a letter to the Administrator, on September 24, 2010, and by 105 Members of the House in a letter submitted August 2, 2010. As the Senate letter stated:

> To help reduce the burden of the rule in a manner that does not compromise public health and safety, … we ask that you carefully consider the extensive record that supported the Agency's determination to include health-based emissions limitations for hydrogen chloride and manganese in the previous Boiler MACT rulemaking that was set aside by the reviewing court on wholly unrelated grounds.[49]

In the March 2011 rule and in the December 2012 reconsideration, the agency did not change its mind on the use of Section 112(d)(4), but it did significantly change the hydrogen chloride standards, presumably based on new data supplied by affected entities. The changes, which are summarized in **Table 3**, allow more HCl emissions from all types of sources, especially from biomass- and gas-fired units.

Table 3. Proposed and Promulgated Emission Limits for HCl Emissions from Existing Boilers

(lbs./million Btu)

Type of Boiler	Proposed (June 2010) Limit	Promulgated (March 2011) Limit	Re- Proposed (December 2011) Limit	Final Reconsidered Rule (December 2012) Limit	% Difference (December 2012 vs. June 2010)
Coal	0.02	0.035	0.022	0.022	+10%
Biomass	0.006	0.035	0.022	0.022	+267%

[48] For more information on the 112(d)(4) issue, see the discussion in the original Boiler MACT proposal at 75 *Federal Register* 32030-32033, June 4, 2010.

[49] Letter of Senator Mary L. Landrieu at al. to EPA Administrator Lisa Jackson, September 24, 2010, p. 2.

Type of Boiler	Proposed (June 2010) Limit	Promulgated (March 2011) Limit	Re- Proposed (December 2011) Limit	Final Reconsidered Rule (December 2012) Limit	% Difference (December 2012 vs. June 2010)
Liquid	0.0009	0.00033	0.0012	0.0011	+22%
Gas 2 (other process gases)	0.000003	0.0017	0.0017	0.0017	+56,566%

Source: U.S. EPA, Proposed and Final Boiler MACT and Proposed Reconsideration *Federal Register* notices, Table 1, and Final Action on Reconsideration, Table 3. Percentages calculated by CRS.

Smaller (Area) Sources

Smaller boilers (those at facilities that emit less than 10 tons of an individual HAP and less than 25 tons of all HAPS combined) face regulations as well, but for the most part the Clean Air Act allows them to meet a less stringent standard, termed "Generally Available Control Technology" (GACT). Most of these units are located at commercial and institutional (as opposed to industrial) facilities, according to EPA.

A separate rule setting standards for these "area sources" was promulgated in March 2011, on the same day as the MACT standards for major sources, and these standards were also reconsidered, with final changes signed on December 20, 2012.[50] EPA did not stay implementation of the 2011 version of the area source rule, and the reconsidered version contains a compliance deadline of March 21, 2014. Unlike the major sources discussed earlier, these facilities will not receive an additional two years to comply.

The area source rule distinguishes boilers that have a heat input capacity of 10 million Btu per hour or more from those that are smaller. The smaller units make up the overwhelming majority of the units covered by the area source rule; they would be subject to GACT. Under GACT, these units would not be required to meet emission limits. Rather, they would be required to meet a work practice standard by performing a boiler tune-up every two to five years. According to EPA, "By improving the combustion efficiency of the boiler, fuel usage can be reduced and losses from combustion imperfections can be minimized. Minimizing and optimizing fuel use will reduce emissions of mercury and all other air toxics."[51]

Some units under the area source rule would be subject to MACT for at least some pollutants. These are the coal-fired units that have a heat input capacity of 10 million Btu per hour or more, but are at *facilities* that don't meet the major source definition because, even counting their boiler emissions, they emit less than 10 tons of any individual HAP and less than 25 tons of any combination of them. According to the agency, these larger boiler units at area sources would need to meet standards based on MACT for some of the pollutants they emit: "The final standards for existing and new coal-fired boilers at area sources are based on MACT for mercury and CO,

[50] The area source rule, as promulgated, is at 76 *Federal Register* 15554, March 21, 2011. The December 2012 reconsidered rule is at http://www.epa.gov/airquality/combustion/actions.html#main.

[51] U.S. EPA, "Final Air Toxics Standards for Industrial, Commercial, and Institutional Boilers at Area Source Facilities," Fact Sheet, p. 2, at http://www.epa.gov/airquality/combustion/docs/20110221aboilersfs.pdf.

and on GACT for PM. The final standards for existing and new biomass boilers and existing and new oil-fired boilers at area sources are based on GACT."[52]

The area source rule would affect approximately 183,000 existing boilers powered by oil, biomass, and coal, located at 92,000 facilities. It would impose annualized costs of $490 million, according to EPA.[53] After considering fuel savings from efficiency improvements that would result from the tune-ups required by the rule, the estimated annualized cost would be reduced.[54] EPA also estimates that about 6,800 new boilers will be constructed at area sources in the next three years; net costs for meeting the area source standards at these facilities are estimated by EPA to be $48 million annually. After accounting for fuel savings from improvements in combustion efficiency, EPA estimates that new sources will experience cost savings of $3.6 million annually rather than incurring compliance costs.[55]

EPA's estimate of costs at area source boilers is summarized in **Table 4**. The table displays EPA data for the promulgated (March 2011) version of the rule. The Preamble to the December 2012 reconsidered rule states, "... as compared to the control costs estimated for the March 2011 final rule, this final rule will not result in any meaningful change in the capital and annual cost due to the increase in emission limits and the decrease in burden on small facilities."[56]

Table 4. Annualized Compliance Costs for Area Source Boiler Rule

Source	Subcategory	Estimated Number of Affected Units	Annualized Cost ($ million)	Annualized Cost per Unit ($ thousand)
Existing Units	Coal	3,710	$37	$10[a]
	Biomass	10,958	$24	$2
	Oil	168,003	$374	$2
New Units	Coal	155	$0.4	$3
	Biomass	200	$2.6	$13
	Oil	6,424	$45	$7
Facility Energy Audit	All	189,450	$52	$0.3

Source: U.S. EPA, *Regulatory Impact Analysis*, Table 3-2. EPA did not change these cost estimates as a result of its December 2012 reconsideration.

Notes: Per unit cost was calculated by CRS. Cost estimates do not include fuel savings from improving combustion efficiency.

[52] Ibid., p. 5. The reconsidered standards can be found in Table 1 of the reconsidered area source rule, on pp. 160-162 of the pre-publication copy, at http://www.epa.gov/airquality/combustion/docs/20121221_neshap_ici_boilers_fin.pdf. These standards do not address most of the pollutants covered by the major source MACT. Compared to the major source MACT, they are also less stringent for the pollutants that they do address.

[53] U.S. EPA, "Final Adjustments to the Air Toxics Standards for Industrial, Commercial, and Institutional Boilers at Area Source Facilities," Fact Sheet, December 20, 2012, p. 3, at http://www.epa.gov/airquality/combustion/docs/20121221_boilers_area_recon_fs.pdf.

[54] EPA estimated this reduction in cost at $48 million for an earlier version of the rule: see Regulatory Impact Analysis, previously cited, p. 3-6.

[55] 76 *Federal Register* 15579, March 21, 2011.

[56] U.S. EPA, Reconsidered Area Source Rule, December 2012, p. 81, at http://www.epa.gov/airquality/combustion/docs/20121221_neshap_ici_boilers_fin.pdf.

a. According to EPA, only 600 of the 3,710 coal-burning units at area sources will be required to meet emission limits. If one assumes that these 600 incur most of the annualized cost incurred by coal-fired units, their per-unit annualized cost might average as much as $60,000.

Gas-fired boilers, of which EPA estimates there are 1.3 million, would not be affected by the area source rule.

Because the costs of compliance are substantially less than for the MACT rule, the area source rule has not been particularly controversial.

Related Rules on Solid Waste Incineration

The Boiler MACT and the Area Source Rule were two of four rules related to boilers that EPA promulgated the same day. The other two rules address boilers that use solid waste as fuel and identify what materials EPA considers to be solid waste. EPA projects that these rules will have less impact than the Boiler MACT, but they address the issues that were at the heart of the court decision that overturned and remanded the boiler rules in 2007. As noted earlier, the U.S. Court of Appeals for the D.C. Circuit, in *Natural Resources Defense Council v. EPA*, found that EPA had wrongly excluded many industrial boilers from the definition of solid waste incinerators, which have more stringent emissions requirements under Section 129 of the Clean Air Act.[57] Thus, in addition to the Boiler MACT and Area Source rules, the agency promulgated a rule on the Identification of Non-Hazardous Secondary Materials that Are Solid Waste,[58] and a rule that would set emission standards for Commercial/Industrial Solid Waste Incinerators (the "CISWI Rule"). The first rule identifies solid waste, and the second sets emission standards for the facilities that burn it. On December 2012, EPA finalized amendments to both of these rules, as well.[59]

Defining Solid Waste

The purpose of this rule is to clarify which materials are considered solid waste when burned in combustion units and which are not. To be considered solid waste, the basic criterion is whether the material has been discarded. Discarded materials are generally considered solid waste; other materials are not. Whether a material is deemed discarded may be unclear or subject to debate, particularly to a recycler who values the material. EPA addresses this by stating that discarded materials can avoid classification as waste if they meet a number of what it calls "legitimacy criteria":

1. if the material is managed as a valuable commodity;
2. if the material has meaningful heating value (or, for a material considered an ingredient, if it makes a useful contribution to the production or manufacturing process); and
3. if the material contains contaminants at levels comparable to or lower than traditional fuels or ingredients.

Non-hazardous secondary materials that meet legitimacy criteria, such as the following, would not be considered solid waste under the rule promulgated in March 2011:

[57] Natural Resources Defense Council v. EPA, 489 F. 3d 1250, 1257–61 (DC Cir. 2007).

[58] 76 *Federal Register* 15456, March 21, 2011.

[59] Pre-publication copies of these rules are available at http://www.epa.gov/airquality/combustion/actions.html.

- material used as a fuel that remains within the control of the generator (whether at the site of generation or another site the generator has control over);
- scrap tires removed from vehicles and managed under established tire collection programs;
- resinated wood residuals, provided they have not been discarded and are used as fuel either by the generator or outside the generator's control;
- material used as an ingredient in a manufacturing process (whether by the generator or a third party);
- material that has been sufficiently processed to produce a fuel or ingredient product; and
- material that has been determined through a case-by-case petition process to not have been discarded and to be indistinguishable in all relevant aspects from a fuel product.[60]

Controversy over this rule centered on how EPA would interpret these criteria for certain recovered materials that are commonly used as fuel, particularly "off-spec" used oil and whole scrap tires. The originally proposed rule did not specifically identify these materials as solid waste. However, in the preamble to the original proposal, EPA did identify these materials as solid waste even when they are used as fuel.

Used Oil

EPA defines used oil as either complying with limits for contaminants of concern ("on-spec") or not ("off-spec"). On-spec oil is exempt from waste management regulations, because the contaminants in it are either at the same concentration or at a lower concentration than in virgin refined fuel oil. Off-spec used oil, on the other hand, even if it is managed within the control of the generator, contains contaminants at levels that are not comparable to traditional fuels, and thus would not be considered a non-waste fuel under the legitimacy criteria described above.

Under previous regulations promulgated under the Resource Conservation and Recovery Act (RCRA, 40 CFR part 279), off-spec used oil could be burned in used-oil-fired space heaters, provided that, in EPA's words:

> (1) The heater burns only used oil that the owner or operator generates or used oil received from household do-it-yourself used oil generators; (2) the heater is designed to have a maximum capacity of not more than 0.5 million Btu per hour; and (3) the combustion gases from the heater are vented to the ambient air. The RCRA used oil regulations base this provision on a finding that uncontrolled emissions from these sources do not pose a significant threat to human health and the environment. (Used Oil Final Rule, 50 FR 49194 (November 29, 1985).) However, consistent with our determination that off-spec used oil be considered a solid waste when burned as a fuel, we believe that off-spec used oil managed within the control of the generator would not qualify for the generator controlled exclusion when burned in a used oil fired-space heater, since contaminant levels are not comparable to traditional fuels. Therefore, we are proposing that off-spec used oil combusted at a unit that is within the control of the generator would be solid waste.[61]

[60] 76 *Federal Register* 15459-15460, March 21, 2011.

[61] U.S. EPA, "Identification of Non-Hazardous Secondary Materials that Are Solid Waste; Proposed Rule," 75 *Federal Register* 31865, June 4, 2010.

If the used oil were classified as solid waste, then the space heater would have to meet the "CISWI" incinerator standards described below, which no space heater is likely to meet.

Most used oil is considered on-spec, but many of those who commented on the proposal argued that unless there is a general exclusion such as that written into the existing RCRA regulations, it would be necessary to test the oil and determine that it is on-spec before burning it in a space heater. Doing so would be costly and impractical. Thus, the proposed regulations, in the minds of many commenters, would have had the practical effect of banning the use of waste oil in space heaters.

The proposal also appeared to contradict the existing RCRA regulations, but did not specifically repeal them. As a result, the Code of Federal Regulations might have contained two conflicting sets of rules applicable to the combustion of used oil.

The final rule promulgated in March 2011 clarified these issues:

> EPA is specifically clarifying in this final rule that used oil combusted in an oil-fired space heater that meets the provisions of 40 CFR 279.23 [i.e., the existing RCRA regulations] need not be tested to establish whether or not such oil is on or off-spec. This includes used oil generated by small facilities such as auto repair shops and machine shops that have such units, and used oil-generated by homeowners who change their own oil (referred to as ''do-it-yourself'' or ''DIY'' oil) that are burned in such units. This is because the CISWI regulations promulgated elsewhere in the *Federal Register* today do not establish emissions limits for such units, and therefore the concerns of the commenters that such units would have to comply with CAA Section 129 standards have been addressed for this population of combustion units.[62]

This clarification is unchanged by the reconsidered final rule.

Scrap Tires

The rule proposed in June 2010 also would have imposed new restrictions on the use of scrap tires as fuel:

> whole used tires (even if collected from tire dealerships and automotive shops and overseen by a state tire collection oversight program) are initially abandoned and thus meet the plain meaning of discard. As a result, whole used tires that are not processed into a legitimate fuel or ingredient (e.g., shredded/chipped with steel belts removed) would be considered a solid waste. We acknowledge that whole tires can be legitimately burned as fuel, but because they have been discarded, whole tires would be considered solid wastes and subject to the CAA section 129 requirements unless processed into a non-waste fuel product.[63]

This would have been a change from current policy and would have affected the use of scrap tires as fuel.

EPA reversed itself in the March 2011 final rule:

> After careful consideration of the comments and all the material in the rulemaking record, including documents cited in the ANPRM [Advance Notice of Proposed Rulemaking] and the preamble to the proposed rule, the Agency agrees that a system where scrap tires are removed from vehicles and are collected and managed under the oversight of established

[62] 76 *Federal Register* 15502, March 21, 2011.

[63] U.S. EPA, "Identification of Non-Hazardous Secondary Materials that Are Solid Waste; Proposed Rule," 75 *Federal Register* 31864, June 4, 2010.

> tire collection programs are not "discarded in the first instance." Such tires (including both whole tires and tires that have been shredded—with or without metal removal) are non-waste when used as a fuel in combustion units. These programs ensure that the tires are not discarded en route to the combustor for use as fuel and are handled as a valuable commodity as required in the legitimacy criterion in today's rule at § 241.3(d)(1)(i).[64]

Further Clarification

Since the March 2011 final rule, EPA has attempted to further clarify what fuels would be considered non-hazardous secondary materials (NHSM), as opposed to solid waste, generally broadening the definitions and criteria to permit more such materials to be used in boilers without the boiler being considered an incinerator.[65] In the December 2012 reconsideration, the agency codified determinations that certain NHSMs are non-wastes when used as fuels; these include scrap tires from tire collection programs, resinated wood, coal refuse recovered from legacy piles, and dewatered pulp and paper sludges that are burned on-site by pulp and paper mills.[66]

The CISWI Rule

The reconsidered Commercial/Industrial Solid Waste Incinerator (CISWI) rule finalized on December 20, 2012, sets emission standards for commercial and industrial facilities that burn materials determined to be solid waste (i.e., materials that do not meet the above criteria).[67] CISWI's emission standards are required to be set under Section 129 of the Clean Air Act, which has more stringent requirements than Section 112. In addition to the five groups of pollutants addressed by the Boiler MACT, the CISWI rule sets emission limits for lead, cadmium, sulfur dioxide, and nitrogen oxides. Section 129 also makes no distinction between major sources and area sources, thus setting the more stringent MACT standards for smaller facilities.

EPA has identified seven subcategories of CISWI facilities: incinerators, small remote incinerators, energy recovery units (ERUs) for biomass fuels, ERUs for coal, ERUs for liquids and gases, and two types of waste burning kilns—a total of 106 existing sources at 76 facilities. The total nationwide annualized costs of compliance for these units are estimated by EPA to be $271 million. EPA estimates the benefits of the final rule, including the avoidance of 47-120 premature deaths annually, at $380 million-$1 billion.[68]

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[64] 76 *Federal Register* 15491-15492, March 21, 2011 [footnotes omitted].

[65] In its December 2011 proposal, the agency identified numerous materials that it considered to be within the definition of "clean cellulosic biomass," and thus are non-waste fuels, including "agricultural derived biomass, other crop residues (including vines, orchard trees, hulls, seeds), other biomass crops used for the production of cellulosic biofuels, hogged fuel, untreated wood pallets, wood pellets, and wood debris from urban areas."

The agency also identified two secondary materials, resinated wood products and tires managed under the oversight of established tire collection programs, as non-wastes, stating further that it "recognizes that certain NHSMs may not meet the legitimacy criteria in all instances, but after balancing the legitimacy criteria with other relevant factors, the material would still generally be considered a non-waste fuel. See U.S. EPA, "Fact Sheet: Proposed Revisions to the Identification of Non-Hazardous Secondary Materials That Are Solid Wastes Final Rule," at http://www.epa.gov/wastes/nonhaz/define/pdfs/fs12-2-11.pdf.

[66] See U.S. EPA, "Non-Hazardous Secondary Material Rulemakings," at http://www.epa.gov/epawaste/nonhaz/define/rulemaking.htm#122012.

[67] U.S. EPA, "Commercial and Industrial Solid Waste Incineration Units: Reconsideration and Final Amendments; Non-Hazardous Secondary Materials That Are Solid Waste: Final Rule," December 20, 2012, pre-publication copy, at http://www.epa.gov/airquality/combustion/docs/20121221_ciswi_recon_fin.pdf.

[68] U.S. EPA, "Regulatory Impact Results for the Reconsideration Final Rule for Standards of Performance for New Stationary Sources and Emission Guidelines for Existing Sources: Commercial and Industrial Solid Waste Incineration

Controversy over the originally proposed CISWI standards focused on a category called "burn-off ovens." Burn-off ovens, as defined by EPA in the originally proposed rule, are units that combust residual materials off racks, parts, drums or hooks so that those items can be re-used in various production processes. Operators of such facilities stated that there are more than 15,000 such units (EPA had identified 36), and they maintained that the units should not be characterized as incinerators, but should be considered boilers, subject to either the Boiler MACT or the Area Source rule. In the March 2011 CISWI rule, EPA concluded that it didn't have sufficient data for burn-off ovens, and removed them and several other types of units from the incinerator definition.[69] As a result, burn-off ovens are considered boilers, and depending on their emissions, are subject to either the major source or area source boiler standards. Burn-off ovens are not discussed in the December 2012 reconsidered rule.

Conclusion

EPA's Boiler MACT has been controversial since its original proposal in June 2010. The version of the rule promulgated March 21, 2011, and the reconsidered version finalized December 20, 2012, are much less stringent than the rule as first proposed. Nevertheless, some stakeholders remain concerned about the potential impact of the rules; challenges—in court, and perhaps in Congress—are still possible.

Members of Congress have been active participants in EPA's public comment process (more than 100 Members of the House and more than 40 Senators wrote EPA regarding the originally proposed rule) and they have remained interested in these rulemakings. In the 112th Congress, bills were introduced in both the House and Senate (H.R. 2250 and S. 1392) to change the Clean Air Act requirements for these rules and the deadlines for implementation. The bills would have provided additional time for implementation of standards and would have changed key aspects of the Section 112 requirements as they apply to boilers and CISWI units. They would have revoked the standards promulgated on March 21, 2011, and required promulgation of replacements for the Boiler MACT and related rules 15 months after the date of the bills' enactment; and they would have required EPA to set a compliance date no earlier than five years after the date of promulgation. At a minimum, this would have given the affected units three years of additional time to comply with MACT standards.

The bills would also have made substantive changes in the Section 112 requirements as applied to boilers and CISWI units. They would have removed the requirements that currently apply in the absence of EPA regulation—what are called the "MACT hammers": under current law, permits issued in the absence of MACT regulations are required to include MACT emission limits determined on a case-by-case basis. The bills would have defined certain sources currently considered as "new" to be "existing" sources, which would be subject to less stringent requirements. And they would have set less stringent requirements for the standards themselves, requiring EPA to choose the "least burdensome" regulatory alternative, and requiring that standards can be met "consistently and concurrently with emission standards for all other air pollutants," which might prohibit EPA's use of the "pollutant by pollutant" approach that it used in setting the currently promulgated standards.

H.R. 2250 passed the House, 275-142, on October 13, 2011. A Senate version similar to H.R. 2250 was offered as an amendment (S.Amdt. 1660) to the surface transportation bill (S. 1813) on March 8, 2012, but was not adopted on a vote of 52-46 (60 votes being necessary for adoption).

Units," December 20, 2012, Tables 4 and 5, at http://www.epa.gov/airquality/combustion/docs/ciswireconfinalria.pdf.

[69] 76 *Federal Register* 80460, December 23, 2011.

In the reconsidered rules, finalized December 20, 2012, EPA took a number of steps in the direction of its critics, giving affected units an additional two years to comply and making many of the emission limits less stringent. Whether these changes will be sufficient to mollify the affected industries and the agency's other critics remains to be seen.

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